A NOTE ON THE LIFE HISTORY OF THE AUSTRALIAN FRESHWATER MUSSEL, HYRIDELLA AUSTRALIS LAM.

By I. D. Hiscock*

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SUMMARY

The life-history of the Australian freshwater mussel, *Hyridella australis* Lam. is recorded.

The glochidium is hookless and will parasitize *Gambusia* (lightly); the callop, *Plectroplites ambiguus* (heavily); but not the carp, *Carassius auratus*. The callop is probably the principal natural host of the glochidium. The larvae attach themselves to the fins but not to the gills and remain on the fish for twenty-two to twenty-three days at 20° to 22° C.

From the discovery in 1832 by Carus that the glochidium, for a long time accepted as a parasite infesting the gills of freshwater mussels, was the larva of the mussel itself, and from that of Leydig in 1866 that the glochidium, after liberation from the parent, completed its development as a parasite on fishes, the life-history of many freshwater mussels has been successfully investigated. The literature published up to 1910 has been summarised by Lefevre and Curtis (1912), who investigated 37 species of American freshwater mussels. Of the life-history of the many Australian mussels little is known, and the author has found none recorded in the literature.

Routine collections by the Zoology Department of aquatic molluscs from the lower River Murray and its swamps have yielded several hundreds of specimens of *Hyridella australis* Lam. These are usually placed in glass dishes and examined for the liberation of cercaria, prior to storing in outdoor aquaria as stock for research purposes. From time to time, female specimens have been observed to extrude embryos from early gastrula to free glochidium stages while under examination in the laboratory. In November 1949 an attempt was made to study the parasitic stage in fishes. The results of this study are reported below.

Latter (1891) found that with the mussels *Anodonta* and *Unio*, glochidium larvae were extruded only in the presence of a fish, though he noted abortion of pre-glochidial stages. Lefevre and Curtis (loc. cit.) have never encountered a single instance in *Anodonta* but found the occurrence fairly common in *Unio complanatus* and in *Quadrula*. They concluded that premature extrusion was probably due to imperfect aeration of the aquarium water.

Abortion has been found to occur in about 1-2% of the collected specimens of *H. australis*. The extrusion of embryos, whether abortive or normal spawning, is similar and has been described elsewhere (Hiscock, 1950). The embryos, in strings of mucus, adhere to the mussel itself or sink to the bottom of the aquarium. The presence of whole or chopped-up fish caused no observable reaction in free glochidium larvae.

* Department of Zoology, University of Adelaide.

The glochidium

The embryos remain enclosed in their vitelline membrane until the mature glochidium stage is reached. Fig. 1 shows a late glochidium enclosed in its membrane, which has no micropyle. The cilia shown at the posterior end were active and probably serve to circulate water within the membrane. Slow opening and closing of the shells was observed in a number of the late glochidia. The rupture of the membrane was accomplished by more active movement of the shells.

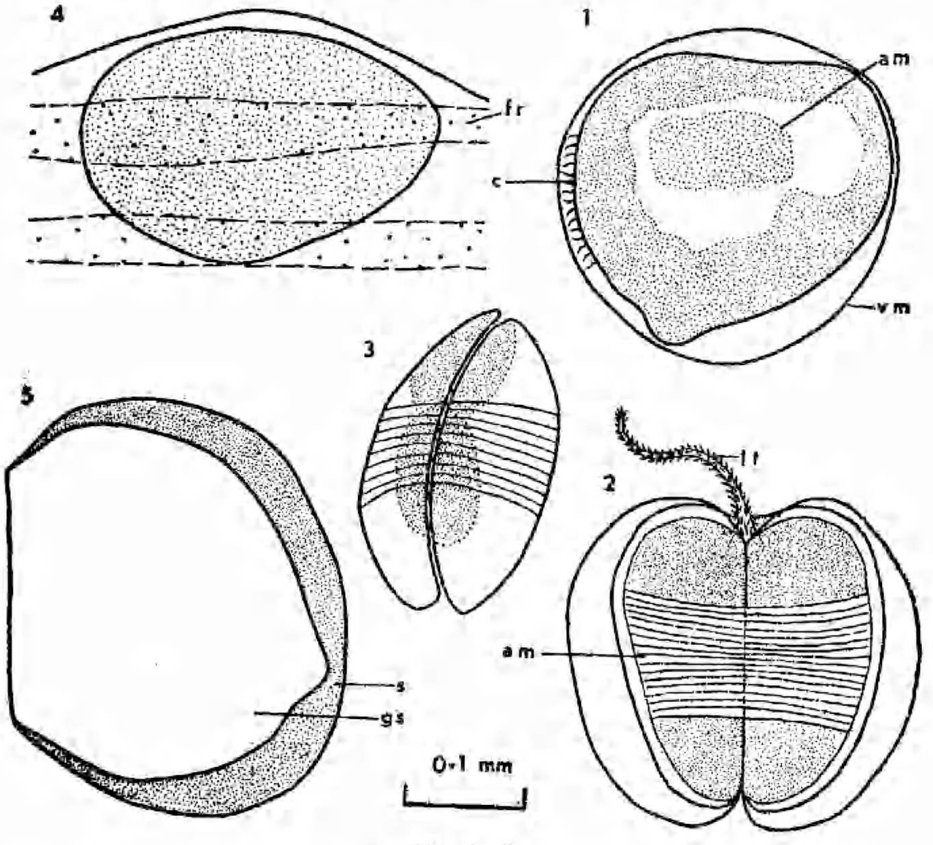

Fig. 1 - 5

1, A late glochidium in its vitelline membrane. 2, Free glochidium, living, seen from below. 3, Free glochidium, stained, from above. 4, Glochidium in the caudal fin of *Gambusia*, seven days after infection. 5, Glochidium, five days after liberation from the fin of a callop.

am, adductor muscle; c, cilia; fr, fin-ray; gs, glochidial shell; lt, larval thread; s, shell proper; vm, vitelline membrane.

The free glochidia were hookless and possessed a typical large adductor muscle and larval thread (once regarded erroneously as a provisional byssus). The cilia were no longer active and the shells gaped widely apart. Camera lucida drawings of living and stained glochidia are shown in fig. 2 and 3 respectively.

The parasitic stage

Free glochidia were placed in aquaria with three available species of fish, *Gambusia;* callop, *Plectroplites ambiguus;* and carp, *Carassius auratus.* All three species of fish were observed to take large numbers of larvae into the mouth and many passed out through the gills. Within half-an-hour some larvae had

attached themselves to the fins of *Gambusia* and the callop, and within two hours the fins of the callop were heavily parasitised with about one hundred larvae. No larvae attached themselves to the carp. Hourly inspection of the gills of all the fish showed that no larvae had attached themselves in this site.

Gambusia were preserved at approximately four-day intervals for more detailed inspection of the parasitic larvae. By the end of twenty-four hours the epithelium of the fin had completely overgrown the larvae, which were still easily visible on the fin margins. Fig. 4 shows a glochidium in the caudal fin of *Gambusia*, seven days after infection. It may be noted that *Gambusia* is an aquarium fish in South Australia; the golden carp, an introduced species, is abundant in the lower Murray and its swamps, while the callop is a native fish.

The post-parasitic stage

Between the twenty-second and twenty-third days after infection all the larvae had become liberated and were collected from the bottom of the aquaria. The water temperature during the parasitic period under observation remained between 20° and 22° C. About one hundred metamorphosed larvae were recovered, mainly from the callop, and were similar in appearance to those figured by Lefevre and Curtis (loc. cit.) for *Lampsilis ligamentina*. New shell growth showed beneath the glochidial shell, the mantle was well developed, and locomotion was accomplished by means of a long ciliate foot. The larvae were placed in shallow dishes on mud taken from the River Murray and daily inspections were made. Fig. 5 shows an outline drawing of a larva five days after liberation from a callop. None was found living after seven days.

Records of the finding of glochidia on fish taken from the lower River Murray have been kept in the Department of Zoology since 1938. Most of the larvae have been observed on the callop, but from the gills, not the fins. Though this is not in accordance with the findings recorded above, it is possible that these glochidia were merely entangled in the gill mucus. The following fish have been observed as hosts of glochidia: callop, *Plectroplites ambiguus;* Murray cod, *Oligorus macquariensis;* congolli, *Pseudaphritis urvillii;* smelt, *Retropinna semoni;* silver perch, *Therapon bidyana;* and catfish, *Tandanus tandanus*. The fish were collected between the months of September and February and in May, but no collections were made in any year between May and September. As no freshwater fish have been examined during that period, it cannot be stated with certainty that no glochidia are present during the winter months. It is probable that the callop is the principal host of the glochidium.

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